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Social Hygiene in Family Life Education*

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"I just can't understand what gets into these children of today," exclaims the mother who almost feels that she's raising a changling. Well—if she did understand, she wouldn't be a normal member of a preceding generation. Her mother and her mother's mother had the same experience. They, too, thought the younger generation was going straight to the bow-wows!

Each new generation is like a secret society, with new customs, dress, passwords, and a jargon all its own. And today's juke-box brigade doesn't want "old folks" in its membership! Too many of them are "drips" or "squares," living in the ancient era of the nineteen-tens and twenties. Youngsters accustomed to airplain speeds of 350 miles an hour and to atom bombs haven't much patience with folks satisfied to loaf along at a forty to fifty mile pace, or who rely on the social Maginot Line of two long decades ago.

But parents shouldn't worry too much. In another couple of decades these teen-agers of today will seem just as outdated to the oncoming youth of the nineteen-sixties and seventies. Provided, of course, the whole universe doesn't "go boom" in the interim!

Various curricular units in the Nation's public schools furnish opportunities in education for marriage and family life. Elementary and advanced science, home economics, sociology, and health and physical education are four subjects where much—but far from enough—direct instruction and guidance in that field are presented. This program is not and should not be thought of merely as "sex education" in the narrow sense, but rather as "human relations education" which includes dealing with many situations that influence and develop sound sex thinking and attitudes.

No responsible modern educator would propose, promote, or support an isolated course labelled "sex education." Just as sex is an integral part of the wholeness of life, so sex education should be an integral part of the whole educational process. In fact, since the ex-

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pression "sex education" seems to have become a fighting term, it would be fine if we could drop it from our vocabularies. Then, perhaps due attention to its component parts would be given in the courses that are their logical bases i.e. human reproduction in biology, the social aspects in sociology, family and houshold economics in home economics, the pubertal changes and the few needed facts about venereal disease in health and physical education.

Probably the weakest argument used against extending sound education on sex is that it would lead to undesirable experimentation. This conjecture is as great a reductio ad absurdum as would be the argument that sound moral teaching leads to immorality. Certainly current and past laissez faire attitudes toward educating on sex have done nothing to lessen experimentation. Proof of this can easily be adduced by anyone who takes the trouble to examine official records of venereal disease and illegitimacy among teen-agers.

According to a 1947 United Press despatch from Duluth, Minnesota, where the fifty-fourth annual meeting of the International Association of Chiefs of Police convened, "sex education in the public schools was recommended as a step toward solving the problem of sex offenses."

Undoubtedly a well considered sex education curriculum will help lessen sex crimes just as it will aid in reducing the incidence of illegitimacy, prostitution and venereal disease. Important as these preventives are, however, sex education has a far more positive role to play in the drama of life. If wisely conceived and promoted it will make for sounder, happier marriages, parenthood and home-building. As a vital factor in character training and guidance, sex education is an element which cannot be omitted logically from any teaching involving social ethics.

At Kansas City, December 5–6, 1945, the Board of Managers, National Congress of Parents and Teachers adopted several far-reaching social hygiene resolutions. Two of them urged the need for continued Federal aid in combating prostitution and allied conditions. The third dealt with the broad social hygiene emphases essential to promote sound, healthy living. Here it is:

> "Whereas, the vitality of the nation and the welfare of the community are largely dependent on the strength and soundness of marriage and family life, and
>
> "Whereas both these institutions are threatened by sexual promiscuity which has greatly increased during the postwar years of social dislocation and
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> Whereas, medical authorities have declared that it is conduct and not medication which lies at the core of the venereal disease problem, and
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> Whereas, sound character training in childhood and youth is the major influence in the promotion of high moral standards of sex conduct; be it
>
> Resolved, that the National Congress of Parents and Teachers urge its membership to take an active part in all community efforts designed to raise the standards of community life; to reinforce ethical sex conduct; and to provide suitable training, guidance, and protection for youth."

When Dr. Ray Lyman Wilbur speaks on social hygiene we welcome an authoritative voice. All familiar with his numerous attainments and distinctions know him as a wise teacher, noted scientist, and ranking administrator. Whether as chancellor of Stanford University, president of the American Medical Association, Secretary of Interior, or president of the American Social Hygiene Association, Dr. Wilbur always is

an outstanding advocate of and worker for human betterment.

In a November letter to your reporter he wrote, "Particularly in this field of social hygiene the axiom still holds true that 'an ounce of prevention is worth a pound of cure.' Our greatest job is in education, to build up sound standards of wholesome living for our young people so that sexual promiscuity, the most vital factor in the spread of venereal disease, can be reduced to the minimum. . . . Good self-management, fairness to others, loyalty to the marriage partner and family, and wholesome happy living can do more prevention than can any other factors."

It was in 1914 that a handful of crusaders decided to organize for the promotion of sound thinking and action on sex problems. Dr. Charles W. Eliot, respected president of Harvard University, assumed leadership of the new movement. He it was who first suggested the name "social hygiene," hoping by such sugar-coating to lend dignity —even respectability—to subjects that had been smirched by tabu and hush-hush down through the ages.

Among Dr. Eliot's associates who advised and rendered signal aid in outlining the declarations of purpose at the launching of social hygiene on its national career were such valiants as Jane Addams of Hull House, James Cardinal Gibbons, David Starr Jordan, Grace M. Dodge, John D. Rockefeller, Jr., and Major Henry Lee Higginson. They furnish but a few of the reasons why we of social hygiene are decidedly proud of our ancestry. For, with this type of leadership, one could be assured the program would be idealistic but not fanatical, sound but not hidebound, progressive but not extreme.

One by one Dr. Eliot and his associates singled out the assorted abuses and misunderstandings for specific study and actions. Building on the groundwork laid by Abram Flexner's report on prostitution in Europe and the investigations and findings of special grand juries in Chicago, New York and other cities, they started to expose the ruthless racketeering of commercialized vice. Then securing the cooperation of a few outstanding health officers and physicians, they leveled their sights at the advertising charlatans and makers of fake nostrums who extracted millions of dollars in tribute from venereal disease sufferers. And in the field of education, they emphasized the logical goals of sex guidance and instruction—better marriages, families and homemaking.

Despite the mighty progress already made, there still are numerous prejudices to be conquered ere our ultimate goals are achieved. "Life is real, life is earnest," sang the poet. And he might well have added, "Life is decent." Centuries of tabu can't be broken down in a mere thirty-five years. Ages of inhibition will leave their residue of intolerance for future generations to combat. There still are many handicaps to overcome before any social hygiene Utopia is attained. But we will have to credit Eliot and his followers with making a notable start in the right direction.

Ray H. Everett

THE CENTRAL ASSOCIATION OF SCIENCE AND MATHEMATICS TEACHERS will meet at the Edgewater Beach Hotel in Chicago on November 25 and 26. A full program of general and sectional meetings has been planned. The banquet speaker, the well known C. C. Furnas, will speak on *Civilization in a Quandary*. Details of the program will be printed in the October issue of *The American Biology Teacher*. The president of the Association is Charlotte L. Grant, Oak Park High School, Oak Park, Illinois.

The Type Organism Approach to Biology Instruction

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Though for some years the emphasis of biology teaching has been directed away from classification systems and taxonomic aims, still a considerable portion of the biology courses and textbooks is given to the task of broadening the learner's orientation and developing his organization of his knowledge of life forms. In most courses, the achievement of this somewhat taxonomic aim is attempted simultaneously with the achievement of the other aims of the course, through the use of the type-organism approach.

This method, in which cursory examination or textbook contact with widely variant life forms is bolstered with intensive study of a single organism, is based on the assumption that type characters may be taught together efficiently as a single psychological grouping. It is the thesis of this article, first, that each type character is a psychological structure which requires care and attention for its accurate development, and second, that the extensive use of type organisms will hinder, rather than build, the effective type of taxonomic organization of life forms which is desired by the biology instructor.

As an example of the problem at hand, consider the textbook approach to the unit or chapter on *Arthropoda*, traditionally exemplified by the crayfish.

In biology courses as they are customarily reported by textbooks, work-books and the literature, such a unit is either preceded or followed by a discussion of several arthropods of widely variant types, some of which make an appeal to the student's earlier experience. In some cases, collections of insects are prescribed or suggested; in others there is no definite program of observation. However, one can with safety say that nearly all such units include a detailed study of the crayfish, and that many, if not a majority of instructional units dealing with Arthropoda, make the crayfish and its study the central organizational structure.

Fortunately, the high school mind does not perform spontaneously the careful scrutiny which was required to solve Agassiz's legendary problem of the fish; if it did, inside the high school classroom, one would daily be required to resolve the ancient taxonomic struggles between the "splitters" and the "lumpers." Any reasonable examination will reveal the fact that the crayfish in adjacent dissecting pans are not alike; how then can the student—or the instructor—be sure that those who deal with the individual animals are facing the same creature? Each has its own size, shape, lengths of appendages, bumps, scars, and color, for each is an individual in its own right, different from all others.

However, we teachers are saved by the fact noted earlier—that the high school pupil commonly does not note the minutiae which distinguish individuals in species other than *Homo sapiens*, so that he sets up an intellectual category—pigeonhole if you please—labels it crayfish and proceeds to dump all such creatures in it. The crayfish species idea comes easily; it is similar

to the concepts attached to the terms, cat, dog, bird, human being, and many others. This sort of term denotes an abstraction of the first order, for as was noted earlier, the first idea here is that of crayfish, brought about by the organism in the dissecting pan and immediately broadened to include those creatures on which fellow pupils are working. Thus, *there is no real crayfish;* there are only individual crayfish, and the human mind has operated upon its experience, building a concept for which there is no objective reality.

But note the tremendous mental feat —of incomparable significance to biology teachers. Now, instead of one crayfish, we are able to say "crayfish" and mean all crayfish of this species. That is, we have *abstracted* certain characteristics from the observation of a crayfish, and we use those characters to define a group. But all the time we have before us a single, unique animal. This animal is the real extent of the verifiable experience; the species idea is a trick which we play upon our experiences that deal with living things.

Now, we group more animals into genera. Thus, on the basis of the possession of common characters, we set up the genus Cambarus, which we use to include several animals which differ more widely and more consistently than do those which we have grouped under the species named. Thus we have an abstraction from abstractions. And so we go on up through family, order, class, and finally subphylum and phylum. The extent of differences between the animals is continually increasing as we rise through abstractions of the second, third, fourth and fifth orders, until the giant Japanese crab, 10 feet between its claws, the tiny water fleas, one-hundredth of an inch in length, the lovely Luna Moth and the repulsive tarantula, the apparently four-legged butterflies and the sixty-legged millipedes all are called Arthropoda. Truly, this is an abstraction of abstractions!

It is not intended to suggest that the abstractions of genus, family and so on are not valuable and important; the discussion here is directed toward their nature instead of their use, for they are of human origin, and are not to be found in the animals themselves. We perceive animals; in the experience which we have concerning animals we proceed to find sequences and correlations, and from such purely human individual activities are born the ideas of the classification groups. If such groupings were inherent in the animals, instead of Linnaeus, perhaps Aristotle would have been their inventor.

In a high school biology class the pupil is asked to develop the group term Arthropoda from intensive study of a single example, the crayfish, buttressed by pictorial examination of other Arthropoda. For an analogy, consider the problem of a student shut up to a single cat and a picture book of dogs, fish, frogs, birds, snakes and cows. Instead of the abstraction of general characteristics, his term "Chordate" would be loaded with individual characters, for any cat is more like itself than like other Chordates. Similarly, a beginning biology student cannot help confusing his Arthropoda with the individual characteristics of a crayfish, for a crayfish is more like itself and other crayfish than like other Arthropoda.

The obvious pedagogical application of this position is the expansion of the learner's experiential base before his attempt to make a generalization. It may be argued that the available time in a course is insufficient to permit such an approach, but this teacher's experience has been that the use of this type

of approach actually expedites learning and provides excellent motivation as well.

In the establishment of the group-concept Arthropoda, for instance, the learner should have an opportunity to examine many animals, among them examples from different classes of Arthropoda. If the learner is asked to sort the animals according to similarity, a little help from the teacher may be necessary, but the distinctions among the animals will take place normally and accurately, *from an experiential base.* A high school student who really "feels" that a centipede, Cecropia moth, garden spider and crayfish are alike in important respects is really an unusual one, though perhaps many biology teachers do not experience difficulty with pupil generalization of exoskeleton to include molluscs and turtles with a failure properly to place insect larvae and soft-bodied moths.

Insect orders may be established in the same manner. Instead of discussing the various insect orders with examples, economic significances, etc., start with perhaps twenty or so insects for each student, and let each one sort the insects into groups without help from his instructor. You'll find that the major insect orders will appear immediately in the youngsters' untutored taxonomic activity; all that remains for the instructor is the formalization of the statements of the group characteristics and the connection of the correct name with each group. The important point here is that classificational activity is characteristic of the human intelligence; provide a reasonable situation for its exercise and it will appear naturally.

From an actual teaching standpoint this procedure will be found far superior to the common insect collection requirement. This technique will also give a remarkable impetus to the reading which follows the observation for it helps to show the pupil a need for his new learning, as well as to make this learning comprehensible.

Such an approach requires the use of far more life forms than those usually available in the biology classroom, but such materials are easily preserved from student collections, or may be easily gathered through intensive collection trips by the better students.

In addition to the instructional advantages gained for the general course aims by the use of this technique, it is possible to establish another aim for the course: the knowledge of local life forms. This aim can now be more easily achieved, for the organisms are continually under observation and it therefore becomes possible to connect names and life habits with an organism at the same time that it is being used to develop an adequate base for building abstractions.

Biology is not by any means taxonomic study alone, but very many of its ideas are of taxonomic character, and it is to the improved establishment of those ideas that this paper is addressed.

THE NINETEENTH ANNUAL MEETING of the Biological Photographic Association will be held in Cleveland, Ohio, September 7 to 10. A well rounded program covering all phases of biological photography is in process of formation, under the leadership of Program Chairman Oscar Richards of American Optical Company and local chairman Thomas J. Lannon.

The preliminary agenda of the Convention calls for one afternoon to be spent at Nela Park, General Electric research laboratories, and home of the famous Horizon House. This will be of special interest to those interested in home building or remodelling.

Information may be obtained from the Convention General Chairman, David Lubin, 130 Keats Lane, Berea, Ohio.

The School Aquarium

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Menominee, High School, Menominee, Michigan

In Menominee High School we have demonstrated in the last two years that an inexpensive class room aquarium may easily become one of the most fascinating class-room natural science attractions. The cry in the field of education these days is for life-like, purposeful, and vicarious experience for every youngster in our secondary schools. Is there any reason why the biology laboratory should fall behind the tempo of the day? We think not, and accordingly, we have introduced through our aquarium, exhibits found only in nature, that most instructive teacher, and through this medium we are attempting to enchance the teaching of laboratory biological science.

Not all students are able to visit the aquarium in Chicago which lies 400 miles away and, therefore, we felt that, even in our school with limited funds, we might bring an aquarium experience to our students.

Since the installation of this aquarium, interest in the science of biology has increased ten fold. Not only do students of the science come in to see this exhibit, but it has been observed that students not enrolled in science are likewise frequent visitors. This holds true between periods, during the noon hour, and before and after school.

To be sure we have a splendid geographical position. Menominee is situated on Lake Michigan, which is a wonderful source of aquatic life. From the shores of the lake came stones, sand, and gravel. The stones were placed in the aquarium, cemented together and built up to a height of about 13 inches at one end of the basin. Sand and gravel was used as a filler between the stone walls.

Each fall brings new aquarium delights to the Menominee biology class room. We annually secure two or three toads, and often times several leopard frogs. These amphibians are then placed on the sand and gravel where they can always be cool and where they can be but a short distance from the water's edge. Ledges are conveniently located among the rocks so that the toads and frogs may retire into seclusion, if they so desire. They often do desire to escape the gaze of curious youngsters.

The word "aquarium" stems from the Latin word "aqua" meaning water and what would an aquarium be without this most important element of nature? We keep our aquarium full of water to about $\frac{1}{2}$ or $1\frac{1}{2}$ inches from the top of the rock layer. This top layer slants into the water so that our amphibians can easily crawl from the water should they wish.

Youngsters soon realize that toads can become real pets. It does not take our students long to have these toads eating from their fingers. The danger is that eager youngsters will over-feed these pets. No chance of starvation here! The lightning flash of the tongues of these toads, provides a source of constant interest to young and old alike. On frequent occasions, teachers from other departments come to visit and to express amazement at nature in the class room. Would that we could provide something like this in our teaching situations! Well, ingenuity is the mother of invention and perhaps our aquarium innovation will be the cause of new experiences in other phases of the school curriculum.

Our aquarium is a year-round project, although in winter we find the toads hibernating for two or three months in the moist sand. At all times we have our aquarium filled with various marine plants, fish from the bay, goldfish, newts and snails.

Students have gone on quests for these exhibits and they are proud to call this aquarium their own. Any school can do as we have done even though they be in desert regions. The reward is self evident in the increased interest the students display in their daily work. Perhaps your aquarium display will not include as many types of divergent life as does ours, but we do believe we have an unique dual purpose aquarium, which could be duplicated in your scientific educational adventure.

For the purpose of feeding these aquarium inmates, we have found it advisable to purchase meal worms and feed these whenever we feel it necessary. It is possible to cultivate meal worms and our supply today stems directly from those purchased from the General Biological Supply House three years ago. As a variation in the diet, ground raw meat is extremely satisfactory. In the springtime we like to keep earth worms as a food possibility. Students have a never ending desire to observe the toads and newts struggling with the earthworms. If you, in your school situation, would desire to install an aquarium such as the one described it might be advisable to use toads instead of leopard frogs because the toads are easily tamed, while the leopard frogs do not take readily to the amenities of class-room civilization. However, the students, being unfettered themselves, do derive much pleasure from observation of these leopard frogs.

The Value of Field Experience in Conservation Education

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In his article *The Role of Biology in Conservation Education* Mr. Sharp stated the whole truth about Conservation teachers in just a dozen words: "There must be found zealous teachers . . . with a broad understanding of ecological relationships." With the same economy of words he then said "It is difficult to provide a full understanding of the contribution of Biology to Conservation education without any field experience."

Zeal and rugged field experiences have attended a thirty year program of conservation teaching in biology classes at Ladysmith, Wisconsin. A brief statement on this program may be of interest to *The American Biology Teacher*. A graduating class seeking a permanent memorial to the memory of a deceased class president chose forty acres of land to be planted to evergreens. This idea of a lasting memorial appealed to many succeeding classes, with the result that the area now has become three hundred and sixty acres, with 125,000 trees planted there. Consequent "field experiences" have included the operation of a forest seedling nursery, cutting and marketing of Christmas trees, pulp and fuel wood and raw material for a local factory. (The operations have netted the forestry fund something over six hundred dollars.)

During the past several years the young plantations have suffered increasing damage by deer. This in fact has become a major forest problem in Wisconsin. Natural reproduction of cedar, hemlock and white pine has practically ceased to function owing to heavy over-browsing of forest areas. In March of this year, the deer damage in the school forest was surveyed and a report given to the student body. Twelve high school seniors made the survey, taking an accurate count of several hundred of each of the four species of planted evergreens. It was found that the white pine plantings have suffered one hundred percent damage on all lands over a fourth of a mile from the highway. At least half are completely destroyed and the others have been repeatedly browsed back at the terminals leaving only shapeless clumps. About twenty five percent of the Norway Pine is badly browsed, the White and Norway Spruce show no serious damage up to date.

The presentation of these facts was supported by a display of browsed and unbrowsed specimens of each variety. The contrast was convincing. One speaker exhibited a wire basket filled with five pounds of white pine foliage. (It filled a half bushel basket). He explained that deer research biologists have found this to be the average daily consumption per hundred weight of live deer. Then it was shown that it would require from fifteen to fifty of our planted pines to furnish this one day ration for one deer. Several hundred students who have assisted in the planting of those trees were suddenly aware that something is wrong in the "ecological relationship" of our school forest. The intelligent presentation made by these boys was a masterpiece in comparison with some of the ignorant ranting and name-calling that goes on in the public hearings and conservation club meetings throughout the state.

This is only one of many field experiences: An average of eight thousand trees are planted each year by members of the biology and agriculture classes. For fifteen years we have provided the "stand-by" crew during the spring and fall fire seasons. Permission is given to this crew to go on fires when called by the local ranger. The conservation truck can pick them up at the school on ten minutes notice. Our fire protection district is noted for the dispatch with which fires are suppressed and for the negligible average actually burned.

Tree planting and fire fighting, logging operations and deer damage surveys—this may not be the orthodox way to teach biology and conservation in high school. Nor can it be denied that forest field-days and unexpected fire calls are extra-curricular headaches of no small order. But there is evidence that the pay-off in vocational guidance is not too bad. Some of that evidence may be found in the following report on a few of the boys who have had these experiences.

At least a dozen of the recent graduates are engaged in seasonal jobs with fish and wild-life, forest and parks or erosion control. Many others are in schools of forestry or other conservation. Two are staff members of a state game farm and one a state wild-life veterinarian. There are several game wardens. Two are engaged in white pine blister work. A boy wrote an amazing article on ruffed grouse when he was in high school biology. He received twenty five dollars for it from an out door magazine. The boy later became manager of a state game farm, later a federal wildlife biologist, and he now owns and operates one of the largest commercial game farms in the Lake States. A farm boy, who planted

a farm windbreak and persuaded his father to fence the cows out of the woodlot, is now a successful federal soil conservation agent operating in south eastern Minnesota. One is head biologist in a state deer research program under Pitman-Robertson wildlife research. Two are area forest rangers, each in charge of fire protection over several million acres of northern Wisconsin. A highschool freshman helped the writer plant several hundred pines in 1927. It certainly was his first conservation experience. Later he became a member of the first 4 H Forestry Club organized in Wisconsin. After graduating from a school of Forestry, he held several important assignments in Federal Forestry. He is now a prominent member of the faculty of a leading American school of forestry.

All of these boys were exposed to some degree of zeal for conservation of the biological resources. Many of them had memorable field experiences; Hours on their hands and knees among the seedling beds or on mile long rows with spades and planting tools on a stubborn terrain; or perhaps all night on a nasty fire with cold water running through their pants from the dripping water cans on their backs.

No doubt many of these men would have found their careers in Conservation without these experiences: on the other hand there is a probability that some of them first saw the vision of their life work through the smoke of a forest fire or in the pitiable remains of a browsed or blistered pine. In any event one zealous teacher of conservation is proud of them.

Clinical Physiology in the High School Biology Course

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The writer has been impressed with lack of knowledge of the hospital patient of the fundamental laboratory techniques as the patient is affected by them. Many people do not know why the doctor and technician want blood or urine. In hospital work it has been found very easy to explain; in teaching, also, it has been very effective and of great interest to the pupils.

The procedures are introduced as part of the unit on the frog. In common practice the frog anatomy and physiology are correlated with that of man. The students dissect the frog in the usual manner. They study the skeleto-muscular system, the digestive (with demonstration of enzyme activity) and the respiratory systems.

The students then expose the circulatory system and compare the anatomy with that of man. Anesthetize a frog with chloroform and demonstrate under low power the circulation in the hind leg. While the frog is still unconscious withdraw about 2cc. of blood from the aortal arch. This vessel may be found in *Rana pipiens* by inserting the hypodermic needle about one half inch in from the shoulder articulation. Drop the blood into two test tubes. To one add 5cc. of a 1% saline solution, to the other add 5cc. of a 2% acetic acid solution. Shake the tubes gently for about one minute. Do not miss the opportunity to point out the formation of acid hematin. Mount a drop of each solution on slides and focus under high power. The nucle-

ated red cells may be seen in the saline mount and the misshapen amoeboid white cells in the acetic acid solution.

Next ask for volunteers to point out the difference between frog blood and human blood. Usually the supply exceeds the demand! Cleanse the middle finger of the volunteer with 70% alcohol. With a sterile no. 20 hypodermic needle prick the finger about ¼ inch from the top. Wipe away the first drop of blood, nurse the finger and drop the blood into two test tubes containing the same amounts of saline and acetic acid solution. The chief points of difference are the non-nucleated red cells and the organization and size of the white blood cells.

The next step is the demonstration of a complete clinical blood count.

Choose a plump rosy cheeked volunteer and follow this procedure:

1. Carefully wash the finger tip with 70% alcohol.
2. Massage the finger in the direction of the finger tip.
3. Using a no. 20 hypodermic needle stab the finger ¼ inch from the top, slightly off center.
4. Wipe away the first drop (usually about 50% plasma).
5. Let one drop fall on a clean cover slip, cover with another, let the blood spread, quickly separate with a sliding motion —let dry.
6. Draw up blood to the 0.5 mark on the red diluting pipette and dilute to the 1.01 mark with Hayem's solution.
7. Draw the blood to the 0.5 mark on the white diluting pipette and dilute to the 1.01 mark with acetic acid solution (a drop of methylene blue in this solution is very helpful)
8. Place a drop on the Talquist scale and read when dry.

The collection of the material will take about half of the period and the remainder of the period may be spent in counting the red and white cells. Holding the pipettes horizontally shake for two minutes in a horizontal plane. Load the hemocytometer following the directions as given in the manual with great care. Under high power count the red cells in five squares and add four zeros. This gives the count in millions. Count the white cells under low power and multiply by fifty. This gives the count in thousands. Since the use of the hemocytometer involves a wet mount it can not be used with some microprojectors. The writer usually attaches a prism to one of the student's microscopes and flashes the field on a screen. This allows all the students to see the field without leaving their seats, permits the use of a pointer as each cell is counted and facilitates the changing of the hemocytometer during the count. It is very important to explain the dilutions in detail and to explain that the red count is obtained under high power while the white is done under low power.

The previous two procedures take the full time of two forty minute periods. In the third period of the blood study, the differential smear is presented. Place the cover slips on two inverted stoppers and flood with Wright's stain. Let stand two minutes. (The strength of the stain is apt to vary but usually two minutes is sufficient.) Add as much water as the cover slip will hold without spilling over and time for four minutes. (Again, the time may vary but practice with the solution will give the best timing.) Dry and mount with Canada Balsam. Mount on microprojector, flash on screen and differentiate under oil immersion. Over all the stain is of various hues of blue and pink. The red cells if normal are pink and the white cells are all blue or of pink and blue. Note the comparative sizes of the red and white cells. Identify the small brick shaped masses of platelets and explain their function in blood clotting. Differ-

entiate between the white cells as follows:

Purple convoluted nucleus, fine granular cytoplasm — polymorphonucleated leukocytes.

Purple convoluted nucleus, red coarse granular cytoplasm—eosinophils.

Purple convoluted nucleus, large blue granules in cytoplasm—basophils.

Nucleus of dark, pale blue cytoplasm in small ring around the nucleus—lymphocytes.

Nucleus of dark blue, large clear blue cytoplasm—monocytes.

This is a normal picture. The leukocytes are about 60%, the lymphocytes about 25% and the eosinophils, basophils and monocytes combined about 5% of the picture with the other 10% divided between all five types. The teacher should count one hundred cells so that the students may get a concept of this variation. It is important to note the quality of the red cells noting any apparent hollows—achromia, malformations—poikylocytosis and variations in the size of the red cells—anisocytosis. These red cell variations are noted by the good technician in all diagnostic examinations and are of importance in the anemias. Frequently they appear in young girls during and just after menstruation.

Next the class dissects the urogenital system. After the anatomy of the kidney and the functions of the glomeruli have been explained, the class does a urinalysis. The qualitive technique is sufficient for insight into the demands of the clinical picture. Two techniques may be used, either the class does the analysis individually or the teacher demonstrates to the class. The procedures are as follows:

Color—the color should be yellow and clear—the darker shades are due to contamination, drugs or concentration in the normal picture—the lighter shades are normally from dilution.

Specific Gravity—use a urinometer—usually about 1.018.

Reaction—Litmus paper—unless oxidation has taken place will be acid.

Albumin—Filter the urine into fuming nitric acid and look for a white ring of albuminous consistency at the meniscus. The writer usually adds egg white to the urines to make the demonstration more vivid and interesting.

Sugar—to 5cc. of Benedict's Solution purchased at the local drug store, add 8 drops of urine and place in a boiling water bath for five minutes. Oxidation is evidenced by a change in color from pale green with no precipitation to brick red. Here again it is well to "doctor" the urine. The urine is then centrifuged and the sediment examined under the microscope. The normal urine will have little to show but bacteria and salts. This is enough, however, to show that the microscopic examination of urine is very important.

When the units on the circulatory and the excretory systems have been completed the importance of the tests as measurers of these systems is then discussed. The discussion covers the diseases that bring about a change in the blood and the urine. The discussion covers the anemias, leukemias, leukopenias, blood parasitoses, malaria and hemophilia. The writer usually demonstrates a bleeding and clotting time. Puncture the ear lobe and let the blood drop every thirty seconds on a piece of filter paper until there is no more flowing—bleeding time. Fill a piece of capillary tubing with blood and break off small piece until the clot has formed. Break the pieces at thirty second intervals, the clotting time. Prepared slides showing the abnormal blood picture are also shown. In the discussion of the clinical physiology of the excretory system the diseases covered are diabetes, tumors, liver damage and anything that may affect the kidney and hence the urine. The class is also instructed in the

basic principles of the metabolator, electrocardiograph, encephalograph and the sphygmomanometer. These discussions round out this phase of the unit. In bacteriology the various pathogenic bacteria are presented.

During this study it is excellent technique to give occupational information to the group. These occupations are discussed: nursing, laboratory technician, physician, ward and hospital aids, public health services and health education. We complete the study with a field trip to one of the local hospitals.

The study of this practical physiology is easy for the biology teacher to incorporate into the frog unit. It takes about a week of actual presentation. The equipment is not too expensive. The work is stimulating and of high interest value to the students. It has been the writer's experience that the students ask for outside reading on this unit. It is necessary to exercise extreme caution in these assignments. It is imperative to emphasize the normal picture to prevent an outbreak of hypochondria in the class room.

UNPUBLISHED MASTERS' THESES

A recent communication from Earl R. Glenn, who is the chairman of a research committee of the National Association for Research in Science Teaching, will be of interest to many biology teachers. The committee is engaged in the task of securing titles of unplublished theses or other manuscripts dealing with science teaching and writing abstracts of them. At the last meeting of NARST a program was laid out to insure more complete coverage of theses dealing with science in grades seven, eight and nine. Many of the titles deal of course specifically with biology.

The following list of titles is typical, except that only titles from 1928 to 1940 are included. Later lists are now in compilation. As space permits *The American Biology Teacher* plans to print lists of titles and abstracts that promise to be of importance or interest to biology teachers. For economy of space, only incomplete citations are given. These will give readers some idea of the type of materials that have been compiled. Further information may be obtained from Dr. Earl R. Glenn, Box 22, Upper Montclair, New Jersey.

I. SURVEYS OF TEXTS, MANUALS AND WORKBOOKS

ADAMS, PAUL LORNE. The analysis of 12 general science and biology glossaries to determine the words essential for understanding or desirable for enrichment of the courses. 1935. Michigan.

BERG, THEODORE R. A quantitative analysis of general science texts. 1931. Colorado.

BROADLICK, J. N. A quantitative analysis of five general science texts. 1931. Kansas.

CLISH, ALBERT R. A study of the content of some general science textbooks for grade 9. 1940. Boston Univ.

PETERSON, GEORGE W. A study of the effectiveness of the use of a workbook in ninth grade general science. 1934. Minnesota.

GRAY, HUGH C. Analysis of the subject matter in textbooks of general science to determine whether the real objectives of the course may be presented to the pupil through them. 1940. East Texas St. T. C.

HELT, RAYMOND L. A analysis of the questions in general science textbooks. 1940. Iowa.

JOHNSON, A. Laboratory lessons in related general science and physiology for vocational homemaking schools in Kansas. 1937. Kansas State College.

LATIMER, ORION P. The overlap of general science and biology in high school. 1929. Iowa.

REDFORD, ALTA LINDSAY. Analysis of health material in general science. 1940. Peabody.

RODEAN, WILLIAM A. The overlapping of the content of textbooks in general science and biology. 1931. Minnesota.

STEERE, RUTH GRAVES. The biological content of general science. 1937. Brown.

WILLIAMS, ARTHUR V. Preparation, testing, and plan of revision of a general science manual. 1932.

ZEIGLER, ROBERT TERRY. A study of fact retention in general science. 1938. Iowa.

II. THE SCIENTIFIC VOCABULARY OF GENERAL SCIENCE

ANDERSON, WENDELL H. An investigation of Adams' list of general science words and an investigation of newspapers science words. 1936. Michigan.

FORBUSH, KEITH C. A study of the vocabulary difficulties encountered by 63 pupils who were studying biology in the ninth grade, and a study of scientific terms appearing in two daily newspapers. 1937. Michigan.

GROPHEAR, HERMAN. A determination of some words used in a certain biology text which are not comprehended by ninth-grade pupils of Dearborn high chool. 1931. Michigan.

KOEHNLIEN, HENRY HAROLD. Vocabulary study in general science. 1937. North Dakota.

BOOKS

PETERSON, ROGER TORY. *How to Know the Birds.* Houghton Mifflin Company, Boston. 144 pp. Over 100 illustrations, 4 colored plates. 1949.

———. *How to Know the Birds.* (Mentor Book, No. 36) New American Library, New York. 144 pp. Over 100 illustrations. 1949.

Once again Roger Tory Peterson has placed the bird students of America in his debt. While his *Field Guide to the Birds* and *Field Guide to Western Birds* remain the best guides to field identification for the student who already knows a little about birds the new book is aimed at the real beginner. *How to Know the Birds,* available in two editions, is a simple introduction to the techniques of bird observation.

After an introductory discussion, which suggests the range of variation among birds and the numbers of species which we find in the World and in North America, the beginner is given explicit, illustrated instructions on "What to Look for." This section suggests certain useful criteria of bird species which every ornithologist learns to use but which are not always suggested in the guides. These are size, shape, actions, flight, field marks, song, distribution, and season of year. The field mark technique is one that Mr. Peterson has made famous.

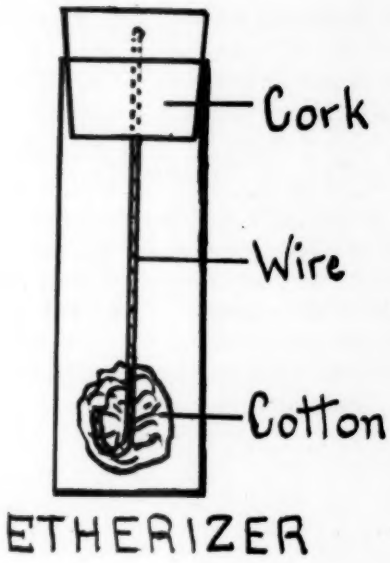
Most of the book is devoted to a section entitled the "Families of Birds." In this section the characteristics which identify the birds of a particular group are considered first; then, very briefly, are given the methods of identifying the species of each group in the field. The species considered are the major ones of the eastern half of the United States. The book should prove to be a successful guide for identification. Those who are prejudiced in favor of colored illustrations will have to learn to use black and white representations of field marks, of course, but for most bird species black and white illustrations are just as useful as colored ones.

The two concluding sections of the book are both valuable assets. The first of these, entitled "Habitats," points out the very significant and very important principle that a bird species does not occur everywhere. It has a definite ecological niche. As Mr. Peterson says, he has never seen a Wood Thrush in a meadow nor a Meadowlark in a forest. While obvious to the experienced observer, failure to recognize this principle is one of the commonest weaknesses of beginners.

The last section of the book is one I found particularly stimulating and valuable. Many birds can be recognized without relying either on field marks or color. They can be recognized at dusk or dawn by their silhouettes against the sky. This last section points out this possibility with a series of effective black and white silhouettes of birds characteristic of different habitats.

The essential matter covered in this work is exactly duplicated in the two printings indicated above. The Mentor volume is, of course, paper covered and printed on thinner paper. In addition, it lacks the four full-page colored plates of the cloth-bound edition. However, it is the best thirty-five cents worth I have seen in the natural history field. At this price, high school biology students can afford to buy it as a supplementary guide for field trips. Perhaps one should have the cloth-bound edition in the library and carry the paper-backed ones into the field. Mr. Peterson is to be congratulated upon making such an excellent guide available to so many people.

GORDON ALEXANDER,
University of Colorado,
Boulder, Colorado



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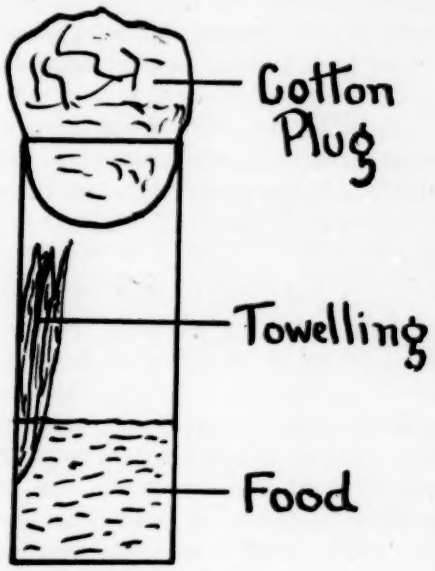

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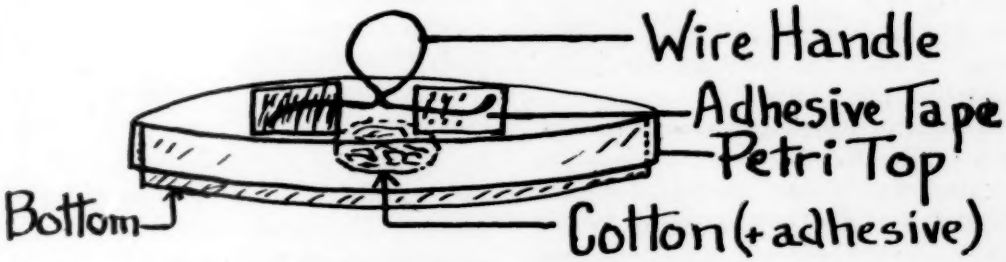

SLUMBER CHAMBER

Simple Equipment for Genetics

We recently received an order for a rather large number of reprints of an article on teaching heredity and at about the same time a letter asking for suggestions for making equipment for raising and handling fruit flies for genetics in high school. Reprints of articles are not available after the article has been printed; they must be ordered beforehand. In the thought that the person ordering the reprints and also the writer of the letter asking for information might get some of the benefit of the article (*Teaching Heredity the Scientific Way*, by Jesse V. Miller, A. B. T. March, 1945) we are reprinting herewith the cut illustrating three of the pieces of equipment built by the author and a quotation from the article. The quotation covers most of the direct reference to the illustration; it is as follows:

"And now what about equipment? All sterilization can be done in boiling water. A cooking pan and a source of

heat will complete the sterilization equipment. Use bottles that hold about an ounce or so. Shell vials are handiest if you buy the glassware, 23 × 85 mm. or slightly larger. You need a large package of *sterile* cotton to plug the bottles, some high grade paper towelling such as Scott's rolls for inside the bottles.

A can of ether will serve to slow the fruit flies down for handling. For a class of 25 or so, a 5-lb. can is about right. Some dropper bottles such as nose drops come in can be secured from any drug store. These are used as ether bottles for students. Any hand lens or magnifier is useful in examining the flies. You'll need about 2 ounces of Moldex.[1] This will keep the molds under control if used along with all other precautionary measures such as sterilization of all instruments and bottles. I even soak the paper towelling in a 2% Moldex solution (in 95% alcohol). Let the towelling dry before inserting into bottles.

"Slumber chambers" are made from Petri dishes.[2]

Stock bottles may be half-pint milk bottles; the smaller bottles will do, but require reculturing more often. Use the same bottles for etherizing as you use for crosses and stock (2 sizes); push a piece of wire through a cork which fits each bottle so that the wire just touches the bottom of the bottle when the cork is inserted. Bend a little loop in the bottom end, and tie a wad of cotton into this loop. Drop ether on this to anaesthetize the flies.

Culture medium may be mashed over-ripe bananas (not *rotten*), or prepared medium. Fill the vials about 1 in. deep with either preparation. Use Moldex in either case. Place folded, treated towelling and 2 drops (3 or 4 in large cultures) of thick "store" yeast (in water) on the medium in each jar, then stopper with sterile cotton. Make crosses at once, or keep prepared bottles in refrigerator until needed. Don't drop flies into the sticky yeast.

If you use prepared corn-meal-yeast medium you will need a box of yellow corn meal, a jar of dark molasses (SO_2-free if possible), 1 lb. dried yeast, some agar (or try gelatin), Moldex, and a live yeast cake. Be sure the bottles are cool before adding yeast.

Complete directions may be obtained by writing *The Carnegie Institution of Washington,* 1530 P Street Northwest, Washington 5, D. C. Ask for a *Drosophila Guide.* A corn-meal-yeast medium is described in this booklet. Booklets sell for 25¢ each.

Drosophila (fruit fly) cultures may be obtained from almost any college genetics laboratory, or the *Carnegie Institution* will give you a few along with the booklet. Biological supply houses sell cultures of most types, and other schools in your vicinity will probably be glad to give you some breed-stock if you will send a student with some prepared bottles.

Now what about "Gremlins"? An aquarium with a cardboard top will serve as an excellent incubator. Heat is supplied by an electric light bulb mounted in a tin can. Punch a hole through the bottom of a quart can to insert socket. The flies want subdued light, not strong light. White paper on the sunny side of the aquarium will regulate this. Maintain a temperature between 70 and 80° for most rapid development of cultures."

[1] *Glyco Products Co.,* 148 Lafayette Street, New York City, manufacturers; may be obtained from various biological supply houses.

[2] If a piece of white paper is used as a bottom, either half may be made into a "top." Otherwise attach handle and cotton to larger half.

BIOLOGY LABORATORIES

PLANARIA. Did you know that the majority of planaria furnished to the supply houses in the Chicago area come from one spot west of the city. There is a spot in a certain river where the collectors "fish" for them. They use a piece of stale liver for bait. (No they do not use planaria hooks.) A period of time elapses, the liver is lifted and the flat worms are attached to it, doing their feding job for the day. Collectors take them by the tens of thousands each season.

DAMPING OFF is a situation which developes during the starting of seed flats when one does not provide proper growing conditions. The seedlings sprout throw their first sets of leaves and in a day or two large patches of them will have constrictions of the stem at the ground surface. Next morning they will be on their sides, wilted over for good. This is known as DAMPING OFF. A fungus attacks the stem at the ground surface under certain conditions especially excessive dampness.

TREATMENT. Mix the dust of a commercial product with the seeds. This seems to hold the damping off in check. These commercial products contain red oxide of mercury or formaldehyde dust. For the past three years it has been the red oxide of mercury. I do not know what formaldehyde dust is but suppose it is some powder impregnated with the gas.

SOIL STERILIZATION. A few years ago I tried soil sterilization for the green house. One method was the use of formaldehyde. The instruction was "just pour it over the soil, mix it up and leave stand for a week." I was in a hurry and used it a day or two after for a soil potting mixture. We had half a green house full of the nicest dead plants you ever saw.

KILLING SOLUTION. Planaria may be killed in a saturated solution of bichloride of mercury. Planaria killed by most methods curl into nearly a circle. These can not be laxed for study and are useless. If the planaria are dropped into a hot concentrated solution of bichloride they will be killed in an extended position. Hot? Yes, about sixty or seventy degrees Centigrade.

EARTHWORMS. Many of the large sized earthworms are obtained in the spring and summer in the parks under the shrubbery. A long rain extending into the night finds many collectors out with flashlights. These "night crawlers" (the earthworms) come to the surface of the soil with their posterior tips in the earthen runway. Collectors move quietly and pounce on them individually.

KILLING, LAXING, FIXING. Earthworms must be killed and fixed slowly. If the process is rapid they contract and are not of much value. The body cavity may be injected with the fixing fluid after killing. This may be cromic acid solution. The blood system may also be injected with a color mass. Relaxation is not the only problem in earthworm preparation. You may run two batches exactly the same way on successive days. One batch will be firm, the other soft and yielding. It is a trick to find that optimum point of control.

PERCH. These are preserved at a time when the market is glutted with fish and the price is low. The fishing boats come in and if they can not unload their catch at a profit they sell to supply houses. It is not an inferior grade of fish, however, only the result of an over supply at the food fish market.

SCIENCE ILLUSTRATED This is an interesting publication for teacher and student alike. It is not completely biological as its name implies, but well worth a look from you.

WAS MY FACE RED? About a month ago I received an inquiry about a certain article in this column. I had to scrape thru a pile of papers to find a copy of my notes. I then answered her letter. The truth of the matter was I had not paid my subscription and they had stopped the issues from coming. Perhaps you should keep yours paid up too. I see this year where they have two years for a discount. Take advantage of this offer.

CHICAGO BIOLOGY ROUND TABLE. This group is conducting a survey of *WORKING CONDITIONS OF BIOLOGY TEACHERS.* They sent out a questionnaire to their members. I. *BUILDING.* Convenience of biology laboratories, number of flights of stairs to climb in a day and other facts. II. *WORKING LOAD,* number of classes, biology and otherwise; science interest of principal, guidance activities, extracurricular activities in school. III. *ORGANIZATION,* number of teachers in department, etc. IV. *SUPPLIES,* who orders them, how are they received, use of movies and films, text books. V. *EQUIPMENT,* animal room, growing room and related topics.

SLUDGE. The sanitary district of Cook County has a big dump at the southwest part of town. They haul out car loads of sludge along the siding and dump it out as refuse. It is an excellent mulch and soil conditioner with an organic base. Residents of the Chicago area drive out with cars and trailers and drive away with it by the basket or ton. It is free. We have used it on the school garden. Perhaps your sanitary district has similar materials which are available.

DISSECTOSCOPE. For dissecting small objects or other close laboratory work you can use the following. On the top of a tripod ten or twelve inches high place one of the large 5 inch lenses obtained from the physics laboratory. They use these lenses in light experiments. This set up makes gross manual manipulations easily observed.

MEDICINE DROPPER TIPS. With a flame draw out several different sized tips on your medicine droppers. A curved fine point is excellent for injecting the fixing fluid under the embryo on the egg yolk. The fine point is excellent for separating individual protozoa, algae, and other small objects. The larger points are good for planaria.

OFTEN SCREW CAPS of bottles and jars are next to impossible to remove. These may be quickly loosened. Tap the top of the bottle or jar lid several sharp blows on the top. Do not at any time strike it from the side. The lids will stand many sharp blows from the top but are more easily broken if hit from the side. The purpose of the blow from the top is to break the seal of the lid liner with the top of the bottle or jar.

PLANT REMOVAL FROM FLOWER POTS. The same procedure may be used to remove a plant and ball of earth from a flower pot. Grasp the pot in the right hand. Place the left hand over the top of the pot with the stem of the plant passing between the fingers. Turn the entire pot and plant upside down in the left hand. With a few deft blows of the pot against the top of a bench the pot will be knocked upward from the ball of earth. Never tap the side of the pot with any instrument.

FOR RELAXING INSECTS. Use a jar or crock with a wide mouth. Fill this container half full of sand which has been dampened. Place the insect on a piece of paper or cloth above the sand. Keep the container covered twenty four to thirty six hours. At the end of this time it will be pliable and can be mounted to the desired shape in the regular manner on a spreading board.

SPECIMEN IDENTIFICATION is important. Museum specimens must have complete data to be useful. This data included identification as to species, sex, exact collection location, date and even time of day. If you add the weather conditions and other factors it is frequently helpful.

CAROLINA TIPS. Are you familiar with this house organ? It is published by Carolina Biology Supply Company, Elon College, North Carolina. Get on their mailing list for a post card.

"INSECTICIDES" and "Pictorial Map of the Americas" may be obtained in quantities from Standard Oil Company (N. J.) Room 1626, 30 Rockefeller Plaza, New York 20, New York. These are free. They have a number of other pamphlets for you folks who double in Physics, Chemistry or General Science.

CLEAN LABELS. Keep the labels of liquid bottles clean by pouring from the mouth of the bottle with the label side up. This is so simple I hestitated to mention it but after looking over a few containers I guess I am the chief offender in such lab carelessness.

LARGE SPECIMENS can not be preserved by immersing them in a fixative and preservative. The body cavity and even portions of large muscles should be injected with the fixing fluid. Use a small needle for the muscles and a medium sized needle for the abdominal cavity.

HARDY CHRYSANTHEMUMS are about the only plants that I know of which can be transplanted while in bloom without disturbing the plants' growth. You should have a few plants of these on the school ground some place. We still have the offspring of a chrysanthemum plant growing at the side of the house down in Indiana. It was there when we bought the house at the beginning of the century.

CARE AND USE OF MICROSCOPES. The microscope manufacturers have published excellent pamphlets on the care and use of the microscope. They also have information on microphotography, microtomes and other instruments.

"PLEASURE WITH PLANTS," a pamphlet published by the Natural History Survey Division, Urbana, Illinois, is worthwhile. It is free to residents of Illinois. Perhaps with a little tact you out of staters might also get a copy.

NATURE BULLETIN. Roberts Mann, Superintendent of Conservation of the Forest Preserve District of Cook County, gets out a page bulletin frequently. On recently was on the Spider Web; another Chickadees, Titmice, and Nuthatches; a third Doves and Pigeons; a fourth The Mosquitofish. The latter is one hundred and eighty three of the series. They come to our place free of charge as they are published.

MARKINGS ON MICROBIOLOGY SLIDES. Do you know the meaning of and how to read the markings on your microbiology slides? *Cs*, *xs*, or *x*, stands for cross section. A cross section is crosswise to the length of the object such as a twig, or a vertical section of the skin; or a vertical section of the brain. A cross section does not always mean a complete section of the object cut crosswise. *Ls* is a longitudinal section, for example a cut lengthwise of a stem, or a nerve. *Ts*, tangent section, is also a lengthwise section of a stem cut as are slabs of a board from a log each cut is a *ts*. Radial sections, *rad sec*, are cut thru the middle of the stem and show the flakes of the fibers in the wood. They are like quarter sawed oak. *Smears* are slides with liquid which is allowed to dry on the slide and processed. Blood smears or bacteria smears are examples. Whole mounts, *wm*, as the name implies are whole objects or their parts mounted. Your Microbiology slides then may read on the label *cs, xs, x, sec, ts, rad sec, smear, wm.*

"TURTOX NEWS." This is published by General Biological Supply House Inc., 761 East 69th Place, Chicago 37, Illinois. This is sent free on request. They also have a series of service leaflets free to biologists.

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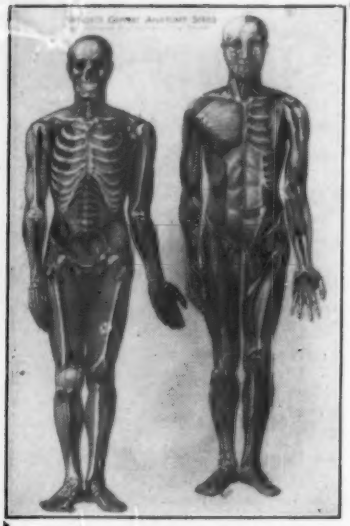

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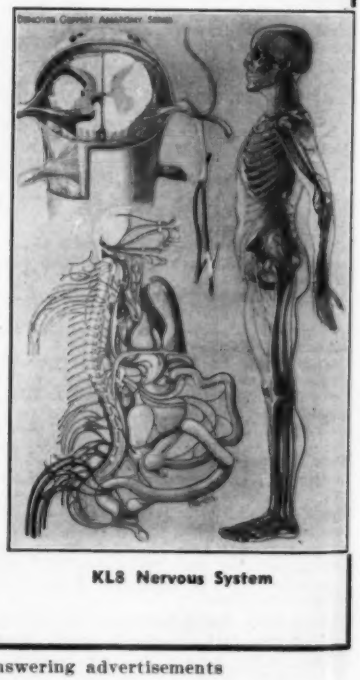
KL8 Nervous System
KL10 Urogenital System

In Preparation

KL6 Topography of Organs
KL9 Digestive System

Write for complete information on this new series of charts and also about our other preparations—models, charts, slides, etc.—for the biological sciences.



KL8 Nervous System

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